01-29-07

AF/1754

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Kim Blum
Name (Print)

Kim Blum
Signature

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JAN 26 2007
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	RUMPF et al.	Examiner: Stuart L. Hendrickson
Application No.:	09/857,490	Group Art Unit: 1754
Filed:	October 1, 2001	Confirmation No.: 5371
Docket No.:	97116CIP (3600-340)	

For: PROCESS FOR PRODUCTION OF CARBON BLACK

SUBMISSION OF APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

January 26, 2007

Sir:

Submitted herewith is an Appeal Brief in the above-identified U.S. patent application.

Please charge the amount of $500.00 to Deposit Account No. 03-0060. In the event that any additional fees are due in connection with this paper, please charge such fees to Deposit Account No. 03-0060.

Respectfully submitted,

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01/29/2007 CNEGA1 00000070 030060 09857490
02 FC:1402 500.00 DA

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For: PROCESS FOR PRODUCTION OF CARBON BLACK

APPEAL BRIEF UNDER 37 C.F.R. § 41

Mail Stop **Appeal Brief – Patents**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

January 26, 2007

Sir:

(1) Identification

The applicant, application, and the Examiner's identification data associated with this paper are provided in the above-captioned heading.

Appellants hereby file an Appeal Brief under 37 C.F.R. § 41.37, together with the applicable fee under 37 C.F.R. § 41.20(b)(2), the period for submitting this Appeal Brief having been extended three months from October 30, 2006 to January 30, 2007 by a concurrently filed Petition for Extension of Time under 37 C.F.R. § 1.136(a).

A Notice of Appeal under 37 C.F.R. §41.31 was previously filed with the applicable fee under 41.20(b)(1) on August 30, 2006.

(2) Table of Contents

(3) Real Party in Interest

The real party in interest in this case is *Cabot Corporation*, the assignee of record.

(4) Related Appeals and Interferences

Appellants are not aware of any other appeals or interferences that will directly affect, be directly affected by, or have a bearing on the Board's decision in the present appeal.

(5) Status of Claims

Claim 1 is canceled.

Claims 2-8 and 15-18 are rejected.

Claims 9-14 are withdrawn.

Claims 2-8 and 15-18 are on appeal.

(6) Status of Amendments

An amendment was filed subsequent to final rejection on June 21, 2006, which was denied entry in the Examiner's Advisory Action dated July 10, 2006.

(7) Summary of Claimed Subject Matter

I. Concise Explanation of the Subject Matter Defined in Independent Claims and Separately Argued Dependent Claims

a) Independent Claim 1

Independent Claim 15 is directed to a furnace carbon black producing process (Page 6, lines 15-17; Fig. 1) comprising the steps of:

(a) obtaining off-gas from a carbon black furnace (page 6, lines 19-21; page 7, lines 3-7; Fig. 1: 10);

(b) dewatering and heating the off-gas and substantially removing any existing carbon black therefrom to obtain dewatered and heated off-gas (page 7, lines 8-31; Fig. 1: 46, 52); then

(c) feeding a combustion gas feed stream comprising the dewatered and heated off-gas (page 8, lines 3-8; Fig. 1: 18) and feeding an oxidant gas stream comprising an oxidant gas (page 6, line 19: Fig. 1: 22) to a burner portion (page 6, lines 18-19: Fig. 1: 12) of the carbon black furnace (page 6, line 18; Fig. 1: 10). The combustion gas feed stream (Fig. 1: 18) is combusted in the presence of the oxidant gas feed stream (Fig. 1: 22) in the burner portion (Fig. 1: 10) of the carbon black furnace (Fig. 1: 10) to produce hot combustion gases (page 6, lines 29-30). Carbon black is produced in a reactor portion (page 6, lines 18-19; Fig. 1: 14) of the carbon black furnace by an interaction of the hot combustion gases with a hydrocarbon feedstock (page 6, lines 29-30; page 7, lines 1-2; and Fig. 1: 34) introduced to the reactor portion downstream of where the dewatered and heated off-gas is introduced in the carbon black furnace (page 6, line 30 to page 7, line 2; Fig. 1: 14, 34, 18, 10);

(d) controlling the combustion gas feed stream and oxidant gas feed stream so that the combusting of the combustion gas feed in the burner portion to produce hot combustion gases takes place in a fuel-rich condition so that the combustion gas feed stream does not completely combust in the burner portion of the carbon black furnace (page 4, lines 14-19; page 10, lines

7-13); and

(e) producing carbon black in the reactor portion of the carbon black furnace by interaction of the hot combustion gases with a hydrocarbon feedstock under said fuel rich conditions (page 6, line 29 to page 7, line 2; page 10, lines 7-13).

b) Dependent Claim 2

Dependent Claim 2 further specifies that in steps (c) - (e) as recited in claim 15, that the heated, dewatered off-gas from step (b) is the *only* combustible gas supplied to the burner portion (page 8, lines 11-14; page 10, lines 14-17), and the combustible gas feed stream and oxidant gas feed stream are controlled to provide deep rich fuel conditions in steps (d) and (e) (page 10, lines 7-13).

c) Dependent Claim 3

Dependent Claim 3 further specifies that the heated, dewatered off-gas is dewatered by means of pressure swing absorption (page 11, lines 8-9).

d) Dependent Claim 4

Dependent Claim 4 further specifies that the off-gas is subjected to plasma heating subsequent to removal of carbon black therefrom and prior to being fed to the burner portion (page 9, lines 10-24; Fig. 1: 84, 86, 90, 92, 94, 96).

e) Dependent Claim 5

Dependent Claim 5 further specifies that the oxidant gas feed stream is subjected to plasma heating prior to being fed to the burner portion (page 9, lines 19-21; Fig. 1: 92).

f) Dependent Claim 7

Dependent Claim 7 further specifies that the combustion gases produced in the burner portion by combustion of the heated, dewatered, off-gas with the oxidant gas feed stream are subjected to plasma heating prior to contacting hydrocarbon feedstock in the reactor portion of the carbon black furnace (page 9, lines 10-14; Fig. 1: 84, 86).

g) Dependent Claim 16

Dependent Claim 16 further specifies that steps (a) through (e) are repeated and wherein step (e) of producing carbon black provides the off-gas for the succeeding step (a) (page 4, lines 8-13; Fig. 1).

h) Independent Claim 18

Independent Claim 18 is directed to a furnace carbon black producing process (Page 6, lines 15-17; Fig. 1) comprising the steps of:

(a) obtaining off-gas from a carbon black furnace (page 7, lines 22-24; Fig. 1: 62, 64, 66);

(b) dewatering and heating the off-gas and substantially removing any existing carbon black therefrom to obtain dewatered and heated off-gas (page 7, lines 26-29); and then

(c) feeding a combustion gas feed stream comprising the dewatered and heated off-gas (page 7, lines 24-26; Fig. 1: 62, 64, 66) and feeding an oxidant gas stream (page 6, lines 19-25: Fig. 1: 22) comprising an oxidant gas to a burner portion (page 6, line 19: Fig. 1: 12) of the carbon black furnace (page 6, line 18; Fig. 1: 10). The carbon black furnace (Fig. 1: 10) to which the combustion gas feed stream (Fig. 1: 62, 64, 66) and oxidant gas feed stream (Fig. 1: 22) are fed is a different carbon black furnace from the carbon black furnace of step (a) (page 3, line 22 to page 4, line 5; page 7, lines 22-27; Fig. 1: 62, 64, 66). Carbon black is produced in a reactor portion (page 6, lines 18-19; Fig. 1: 14) of the carbon black furnace (Fig. 1: 10) by an interaction of the hot combustion gases with a hydrocarbon feedstock (page 6, line 29 to page 7, line 2; Fig. 1: 18, 22) introduced to the reactor portion (Fig. 1: 34) downstream of where the dewatered and heated off-gas is introduced in the carbon black furnace (page 6, line 29 to page 7, line 2; Fig. 1: 14, 34, 18, 10);

(d) controlling the combustion gas feed stream and oxidant gas feed stream so that combustion of the combustion gas feed in the burner portion to produce hot combustion gases

takes place in a fuel-rich condition so that the combustion gas feed stream does not completely combust in the burner portion (page 4, lines 14-19; page 10, lines 7-13); and

(e) producing carbon black in the reactor portion of the carbon black furnace by interaction of the hot combustion gases with a hydrocarbon feedstock under said fuel rich conditions (page 6, line 29 to page 7, line 2; page 10, lines 7-13).

8) Grounds of Rejection to be Reviewed on Appeal

1) Whether Claims 2 and 15-18 are unpatentable under 35 U.S.C. §103(a) over Rothbühr et al. (U.S. Pat. No. 4,636,375).

2) Whether Claims 3 and 8 are unpatentable under 35 U.S.C. §103(a) over Rothbühr et al. in view of Sircar (U.S. Pat. No. 5,240,472) and Doshi (U.S. Pat. No. 4,690,695).

3) Whether Claims 4-7 are unpatentable under 35 U.S.C. §103(a) over Rothbühr et al. in view of Lynum (U.S. Pat. No. 5,527,518).

(9) Argument

1) Rejection Under 35 U.S.C. § 103(a) Over Rothbühr et al. (U.S. Pat. No. 4,636,375).

Claims 15 and 17

In the Final Office Action (page 2), the Examiner interprets and applies the descriptions of Rothbühr et al. to the present claimed invention in the following manner:

> Rothbuhr [sic] teaches in column 8 treating carbon black off-gas to remove water and carbon, then recycling it. While not explicitly teaching heating before recycling, this is suggested in column 9 and thus obvious to increase the carbon yield, and/or efficiency of combustion. The fuel rich mode is suggested as an option in col. 1 and 2. Note that col. 9 line 60-63 shows two examples. The 880 degree example shows less combustion and thus meets the claims, as less product is formed.

The present invention is directed to a process for the manufacture of carbon black that employs dewatered, heated off-gas in a fuel rich combustion strategy.

Independent Claim 15 on appeal particularly recites a furnace carbon black-producing process wherein off-gas from a carbon black furnace is dewatered and heated, following substantial removal of carbon black therefrom, and fed as at least a part of a combustion gas feed stream to a burner portion of the carbon black furnace. The claim also explicitly provides that the combustion gas feed stream and the oxidant gas feed stream are controlled to provide a "fuel-rich" condition so that the combustion gas does not completely combust in the burner portion of the carbon black furnace (e.g., Claim 15(d)-(e)). Further, the claim describes the carbon black furnace as being a type in which a combustion gas is combusted in the presence of an oxidant gas in a burner portion of the furnace to produce hot combustion gases and then the hot combustion gases interact with a hydrocarbon feedstock in a reactor portion of the furnace. Therefore, Claim 15 explicitly recites that the claimed process is fuel-rich and clarifies that the characterization of the process as fuel-rich includes the combustion of the combustion

gas feed stream in the presence of the oxidant gas feed stream in the burner portion of the furnace.

It is found that furnace carbon black production processes in accordance with Claim 15 and the other claims on appeal make it possible to generate higher yields of carbon black at a given surface area, and better production economics (see, e.g., page 8, line 28 to page 9, line 2). In contrast to earlier unsuccessful strategies, the present invention provides a more economically advantageous and commercially viable fuel rich strategy for producing furnace carbon blacks through the use of off-gas from the same or different furnace as combustion gas in the burner portion of the furnace.

With respect to Rothbühr et al., this reference relates to a process for producing furnace blacks of variable carbon black structure according to customary furnace black technology whereby a low ratio is adjusted between combustion air and carbon black raw material, wherein the carbon black structure is lowered by removing it entirely or partly from the exhaust gases, and the residual gas thus obtained is completely or partially recycled to the combustion chamber of the reactor (Abstract). Rothbühr et al. does not include a process flow schematic of this carbon black producing system.

Appellants point out that Rothbühr et al. does <u>not</u> teach or suggest any instance in which a <u>fuel-rich condition</u> is used in a carbon black producing process wherein an off-gas is recycled (*cf.*, present Claim 15(d)-(e)). In fact, Rothbühr et al. is a self-described teaching of a <u>lean gas</u> strategy for carbon black production (e.g., col. 3, lines 47-60; col. 9, lines 44-45). As such, Rothbühr et al. merely reflects the background prior art described in the instant patent application (e.g., see page 3, lines 6-9), and can be expected to have the drawbacks associated with such prior lean gas strategies, viz., relatively lower carbon black yields (e.g., page 2, lines 6-8).

In particular, col. 1 of Rothbühr et al. describes the effects of varying the parameters of

the amount of combustion air (the "oxidant gas" in the present claims), fuel gas (the "combustion gas feed stream" in the present claims) and carbon black raw material (the "hydrocarbon feedstock" in the present claims) and states, at column 1, lines 45-48, that "[t]he fuel gas required for energy production (or some other fuel) is mostly employed in such volumes, related to the volume of oxygen introduced with the combustion air, that it is present in deficiency." One skilled in the art, by reading Rothbühr et al., at col. 1, lines 45-48, would clearly understand that it is the fuel gas that is present in deficiency. Thus, the process described at col. 1, lines 45-48, of Rothbühr et al. is a fuel-lean process, which teaches away from the claimed invention.

Rothbühr et al., at col. 1, lines 49-52, also states that "...it is one of the principles of the furnace black process that the volume of oxygen is used in deficiency relative to the fuel <u>and</u> carbon black raw material volume." (Emphasis added) In other words, the volume of oxygen is less than the combined volume of fuel <u>and</u> carbon black raw material. If the volume of oxygen is equal to or more than the combined volume of fuel and carbon black raw material, the oxygen would completely burn the carbon black raw material and the process would <u>not</u> result in production of a carbon black. The statement at col. 1, lines 49-52, does not indicate that the volume of oxygen is less than the volume of fuel by itself. In fact, one skilled in the art, by reading Rothbühr et al., at col. 1, lines 49-52, in view of Rothbühr et al., at col. 1, lines 45-48, would conclude that the amount of oxygen is more than the amount of fuel, but not more than the combined amount of fuel and carbon black raw material. In Claim 15 on appeal, on the other hand, it is clearly specified that the fuel-rich condition occurs in the burner portion of the carbon black furnace as a result of controlling the combustion gas feed stream and the oxidant gas feed stream.

In addition, Rothbühr et al., at col. 1, lines 52-56, states that "...whenever as little as possible air-oxygen is to come into contact with the carbon black raw material and is to burn

the latter, as high volumes as possible as fuel gas are used." The statement at col. 1, lines 52-56, on its face, would appear to indicate a trend to run a process wherein the amount of fuel reaches or approaches stoichiometric. However, although col. 1, lines 52-56, indicates an increase in the amount of fuel, according to Rothbühr et al., at col. 1, lines 58-62, the amount of fuel cannot be greater than the amount of oxygen because such a process would damage the liner of the reactor. See Rothbühr et al., wherein Rothbühr et al. teaches away from having a fuel-rich process by stating, at col. 1, lines 58-62, that a high amount of fuel leads to higher temperature loads, which can destroy the inner liner of the reactor. For the reasons set forth above, Rothbühr et al. at col. 1, lines 45-63, clearly describes a fuel-lean process.

Moreover, Rothbühr et al., at cols. 7 and 8, further emphasizes the production of carbon black using a <u>fuel-lean</u> process by stating that the process includes an air volume constant of 27 Nm^3/h and a natural gas constant of 1.9 Nm^3/h. One skilled in the art would recognize that an air volume constant of 27 Nm^3/h and a natural gas constant of 1.9 Nm^3/h relate to a fuel-lean process.

Moreover, in several other places, Rothbühr et al. clearly characterizes its process as being a fuel lean process. See, for example, col. 3, lines 47-60 and col. 9, lines 45-49. Indeed, Rothbühr et al. specifically refers to: "*... the lean gas used in the invention ...*" in the examples provided therein (see col. 9, line 44-45). Thus, the inventors in Rothbühr et al. characterized their own described invention as a "lean gas" strategy, and not something else.

Since the present claimed invention relates to a process using a fuel-rich process and Rothbühr et al. uses a fuel lean process, as those prior inventors themselves appreciated and represented in their own patent, Rothbühr et al. does not teach or suggest the invention of Claim 15 on appeal.

Nonetheless, in reply to Appellants' arguments of record, which are reflected above, the Examiner further stated the following in the Final Office Action (page 3):

> Rothbuhr teaches a shortage of oxygen and thus suggests, at the very least, a fuel rich process. Rothbuhr clearly teaches the problems of having too much oxygen; in order to avoid the problem of having oxygen react with the feedstock, an oxygen deficiency in the flame is an obvious and seemingly necessary condition. Concerning the figures of 27 and 1.9, it is noted that the recycle gas may push the system to fuel rich, depending upon the exact composition thereof. Given what the reference teaches, this is at very least an obvious expedient.

Appellants note that the Final Office Action fails to cite column and lines from Rothbühr in support of the above-indicated assertion that "Rothbuhr teaches a shortage of oxygen and thus suggests, at the very least, a fuel rich process." To the extent the Examiner possibly is relying on the descriptions found at col. 1, lines 49-52 of Rothbühr in support of this assertion, Appellants have already explained that this passage means that the volume of oxygen is less than the combined volume of fuel <u>and</u> carbon black raw material. Again, if the volume of oxygen is equal to or more than the combined volume of fuel and carbon black raw material, the oxygen would completely burn the carbon black raw material and the process would <u>not</u> result in production of a carbon black. Therefore, the statement at col. 1, lines 49-52 of Rothbühr does not indicate that the volume of oxygen is less than the volume of fuel by itself.

Moreover, this passage (i.e., col. 1, lines 49-52) in Rothbühr would have been reasonably construed by one of ordinary skill in the art at the time of present invention as merely being applicable to conventional usage of raw hydrocarbon feedstocks as the combustible material introduced to the carbon black furnace. There is no teaching or suggestion by Rothbühr that the "principle" indicated in the *background section* thereof at col. 1, lines 49-52 would be applicable to combustion gas feed streams that are recirculated off-gas derived from a carbon black furnace.

Appellants also disagree with the premise of this rejection (Final Office Action, page 3) as it is based upon what "may" [or may not] happen with respect to the recycle gas "...

push[ing] the system to fuel rich" in the system disclosed by Rothbühr, especially when those prior inventors repeatedly and explicitly state that their objective is the exact opposite scenario -- a lean-gas strategy.

Apropos in this context are the provisions of M.P.E.P. §2144.03, which, in pertinent part, are reproduced as follows:

> As noted by the court in *In re Ahlert*, 424 F.2d 1088, 1091, 165 USPQ 418, 420 (CCPA 1970), the notice of facts beyond the record which may be taken by the examiner must be "capable of such instant and unquestionable demonstration as to defy dispute" (citing *In re Knapp Monarch Co.*, 296 F.2d 230, 132 USPQ 6 (CCPA 1961)) ... ... Furthermore, as noted by the court in *Ahlert*, any facts so noticed should be of notorious character and serve only to "fill in the gaps" in an insubstantial manner which might exist in the evidentiary showing made by the examiner to support a particular ground for rejection. It is never appropriate to rely solely on common knowledge in the art without evidentiary support in the record as the principal evidence upon which a rejection was based. See *Zurko*, 258 F.3d at 1386, 59 USPQ2d at 1697; *Ahlert*, 424 F.2d at 1092, 165 USPQ 421.

The Examiner's substantial gap-filling allegation that Rothbühr et al.'s recycle gas "may" push that prior system to fuel rich is <u>not</u> "capable of such instant and unquestionable demonstration as to defy dispute." Moreover, such speculation flies in the face of what the reference actually teaches as being their invention - a lean gas strategy.

Alternatively, to the extent the Examiner suggests that a "fuel rich" condition may be inferred from the Rothbühr et al.'s reference, at cols. 7 and 8 thereof, to an air volume constant of 27 Nm^3/h and a natural gas constant of 1.9 Nm^3/h, one skilled in the art would recognize, as Appellants noted above, that an air volume constant of 27 Nm^3/h and a natural gas constant of 1.9 Nm^3/h correlate to a fuel-lean process.

According to the provisions of M.P.E.P. §2144.02, which, in pertinent part, are reproduced as follows:

> The rationale to support a rejection under 35 U.S.C. 103 may rely on logic and sound scientific principle. *In re Soli*, 317 F.2d 941, 137 USPQ 797 (CCPA 1963). However, when an examiner relies on a scientific theory,

> evidentiary support for the existence and meaning of that theory must be provided. *In re Grose*, 592 F.2d 1161, 201 USPQ 57 (CCPA 1979) ...

The Final Office Action does not articulate a scientific principle, nor evidentiary support therefor, by which the "figures of 27 and 1.9" referenced in Rothbühr et al. would have intrinsically resulted in fuel-rich conditions in Rothbühr et al.'s otherwise self-described "lean gas" system, and Appellants are aware of none.

It similarly is unclear, from a technical standpoint, how the "two examples," and the "880 degree example" in particular, as set forth at col. 9, lines 60-63 of Rothbühr et al., implicitly and necessarily would involve fuel-rich conditions, as suggested by Examiner in the Final Office Action (page 2). The Examiner is understood to be referencing examples "4/V121" and "3/V153" at column 9, lines 60-63 thereof. Appellant notes that the first-mentioned example indicates a temperature of "80," and not "880" Celsius. In any event, the Examiner is understood to allege that Example "4/V121" shows less combustion and purportedly less product, which implicitly means fuel-rich conditions were involved. Appellants point out that the technical nexus between the Examiner's assertion and conclusion in this respect is not explained in the record, nor is it self-evident in the absence of such explanation. As previously discussed, the inventors of Rothbühr et al. state that their process and system operates on a "lean gas" condition.

In view of the above, it is apparent that the Examiner's rejection of Claim 15, as premised on Rothbühr, is deficient and fails to teach all of the claimed recitations. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). The Examiner's rejection of Claim 15 fails to meet this criterion.

For at least these reasons, the Examiner's rejection of Claim 15 should be reversed.

Claim 2

With respect to Claim 2, Rothbühr et al. does not teach or suggest deep rich fuel

conditions or a process in which the heated, dewatered off-gas is the *only* combustible gas supplied to the burner of a carbon black furnace as required by dependent Claim 2. This claimed recitation is not accounted for in the final rejection, nor does Appellant find the feature arguably present anywhere within the teachings of Rothbühr et al.

As explained in the present specification (e.g., page 10, lines 7-28), an improved economic benefit is achieved by this presently claimed invention, sufficient for successful commercial implementation, through the use of a deep fuel rich combustion strategy employing *solely* carbon black furnace-off gases from the same or one or more different carbon black furnaces, wherein the off-gases are heated and dewatered, and contain little or no carbon dioxide. This present invention thereby solves prior existing economic impediments to operating under fuel rich conditions, where raw material costs generally were uneconomically high, and makes it possible to avoid lean combustion strategies, such as disclosed by Rothbühr et al., having relatively low carbon black yields. The deep fuel rich combustion strategy of the present invention is found to yield off-gas substantially devoid of carbon dioxide. It is believed that carbon dioxide and water will oxidize the hydrocarbon feedstock, forming carbon monoxide and hydrogen. Employing off-gas in a deep fuel rich combustion strategy substantially reduces the concentration of these species in the furnace off-gas, as well as consuming substantially all of the oxygen from the combustion air and any oxygen enrichment. Consequently, employing heated, dewatered off-gas in a deep fuel rich combustion strategy is now found to substantially reduce the concentration of carbon dioxide and water and, correspondingly, substantially increase the yield of carbon black from the hydrocarbon feedstock.

Claim 2 is further patentably distinguishable from Rothbühr et al. for the reasons indicated above relative to its parent claim, Claim 15, and reference is made thereto.

For at least these reasons, the Examiner's rejection of Claim 2 should be reversed.

Claim 16

Claim 16 on appeal requires that steps (a) through (e) per Claim 15 are repeated and that step (e) of producing carbon black provides the off-gas for the succeeding step (a). The Final Office Action does not specifically indicate how Rothbühr et al. is applicable to Claim 16 now on appeal. As noted above, Rothbühr et al. does not include a process flow schematic in any figure. Example 1 of Rothbühr et al. references use of a small furnace black reactor which "essentially corresponds" to the reactors of German OS (Offenlegungsschrift) No. 2530371.[1] Based on Appellants' review of German OS (Offenlegungsschrift) No. 2530371, this reference, from all appearances, fails to show recirculation of off-gas to the combustion chamber of a carbon black furnace.

As such, Rothbühr et al. does not disclose the recitations of Claim 16 on appeal, and certainly not in an enabling manner.

Claim 16 is further patentably distinguishable from Rothbühr et al. for the reasons indicated above relative to Claim 15, and reference is made thereto.

For at least these reasons, the Examiner's rejection of Claim 16 should be reversed.

Claim 18

Claim 18, step (c) recites, *inter alia*: "*... the carbon black furnace to which the combustion gas feed stream and oxidant gas feed stream are fed is a different carbon black furnace from the carbon black furnace of step (a) ...*".

The Final Office Action does not separately address Claim 18, much less explain how the above-noted claim feature of Claim 18 is taught or suggested by the relied upon reference to Rothbühr et al. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Appellants submit that Rothbühr et al. does not teach or suggest using a carbon black

[1] According to the espacenet database, http://ep.espacenet.com/, U.S. Pat. Nos. 4,179,494 and 4,228,131 are foreign counterparts to German OS (DE) 2530371.

furnace to which the combustion gas feed stream and oxidant gas feed stream are selectively fed is a different carbon black furnace from the carbon black furnace of step (a) as claimed in Claim 18. For example, as illustrated and explained in the present specification (page 7, lines 20-29; Fig. 1), off-gas feed lines 62, 64, and 66 deliver off-gases from different respective carbon black furnaces than furnace 10.

An advantage of this claimed arrangement, *inter alia*, is that it will be economically advantageous in certain embodiments to employ the highest heat value off-gas available from amongst multiple different carbon black furnaces, as the energy value of the off-gas depends in large part on the grade of carbon black being produced by a given furnace (see page 3, line 25 – page 4, line 5). By this claimed arrangement, the selection of off-gases from the different furnaces can be changed from time-to-time, as appropriate, to allow use of the most suitable off-gases available from the different furnaces. By providing the option of selected and mixing off-gas from multiple different carbon black furnaces, significantly improved production flexibility and economics can be achieved as the particular grade of carbon black being produced at the various different furnaces changes from time-to-time with consequent changes in the energy value of the off-gas. Rothbühr et al. fails to teach use of different furnace off-gases in the presently claimed manner, much less suggest the above-indicated advantages and benefits accruing from the claimed arrangement.

Claim 18 is further patentably distinguishable from Rothbühr et al. for the reasons indicated above relative to separate independent Claim 15, and reference is made thereto.

In view of at least these reasons, Appellants request reversal of the Examiner's rejection of Claim 18.

2) Rejection Under 35 U.S.C. § 103(a) Over Rothbühr et al. In View Of Sircar (U.S. Pat. No. 5,240,472) and Doshi (U.S. Pat. No. 4,690,695).

Claims 3 and 8

In the Final Office Action (page 2), the Examiner argues that Claims 3 and 8 are obvious over Rothbühr et al. in view of Sircar and Doshi for the following reasons:

> Rothbuhr teaches water removal but it does not specify PSA. However, Sircar teaches in col. 5 line 55 using PSA to dewater a gas. Thus using it in the process of Rothbuhr an obvious expedient [sic] to perform the water removal. Concerning claim 8, Rothbuhr does not identify the source of oxygen, however Doshi teaches in column 11 line 5 that it can separate oxygen by PSA. Thus, using oxygen from any source, such as PSA, is an obvious expedient to create the oxygen used by Rothbuhr.

Appellants disagree with the Examiner's rationale for making this rejection and request reversal thereof for the following reasons.

Sircar and Doshi do not relate to carbon black producing processes and do not overcome the deficiencies of Rothbühr et al. described above. Therefore, Claims 3 and 8 are allowable for at least the same reasons that independent Claim 15 is allowable over Rothbühr et al. as discussed above.

Further, regarding the specifics of Claims 3 and 8, and with respect to the Examiner's comment that if the Applicants claim a PSA process then any PSA reference is considered analogous, the Appellants respectfully disagree.

Sircar, at col. 5, lines 52-56, states that residual water and carbon dioxide can be removed from a <u>nitrogen-containing gas stream</u>, such as air, by methods such as PSA. The Examiner has not provided any proper motivation why one skilled in the art would look to Sircar for PSA. Certainly, the primary reference to Rothbühr et al. does not provide any motivation and Sircar does not relate to carbon black.

With respect to Doshi, this patent relates to a permeable membrane for initial bulk gas separations which makes use of a pressure swing adsorption system. From a reading of Doshi, there is no teaching or suggestion of using this system in the manufacturing of carbon black.

Accordingly, Doshi is also non-analogous art with respect to the claimed invention and, furthermore, one skilled in the art would not look to Doshi and combine it with the production of carbon black patent relied upon by the Examiner, namely Rothbühr et al. The only motivation that one would have for applying this technology to carbon black would be through the use of hindsight or an obvious to try standard, both of which are improper for purposes of determining patentability.

Accordingly, the Examiner's rejection of Claims 3 and 8 under 35 U.S.C. §103(a) over Rothbühr et al. in view of Sircar and Doshi should be reversed.

3) Rejection Under 35 U.S.C. § 103(a) Over Rothbühr et al. In View Of Lynum (U.S. Pat. No. 5,527,518).

Claims 4 and 6

In the Final Office Action (page 2), the Examiner argues that Claims 4-7 are obvious over Rothbühr et al. in view of Lynum for the following reasons:

> Rothbuhr, supra, does not explicitly teach reheating the recycled gas using plasma heating. However Lynum in column 5 teaches this technique to make carbon black. Plasma preheating the gases of Rothbuhr is thus an obvious expedient to assure efficient combustion and restore heat lost during the water-removal steps.

With respect to Claim 4, Appellants disagree with the Examiner's rationale for making this rejection and request reversal thereof.

As discussed above, Rothbühr et al. does not teach or suggest the limitations of independent Claim 15. The arguments made above with respect to Rothbühr equally apply here. In particular, Rothbühr et al. does not teach or suggest any instance in which a fuel-rich condition is used in a process wherein an off-gas is recycled, but rather teaches producing carbon black in a fuel-lean condition. Lynum et al. does not overcome these deficiencies of Rothbühr et al. Therefore, Claim 4 is allowable for the same reasons that independent Claim 15 is allowable over Rothbühr et al., as discussed above.

Moreover, regarding Claim 4 in particular, Lynum et al. relates to passing a preheated feedstock of methane and/or natural gas through a plasma torch to cause a pyrolytic decomposition of the feedstock. Thus, Lynum et al. does not teach or suggest recycling the off-gas, and further plasma heating of the off-gas which has been preheated to a certain degree via a suitable heat exchanger. According to Lynum et al., a plasma torch increases the temperature of the feedstock to the decomposition temperature for the raw material. This temperature is too high to be used for merely preheating the feedstock. Lynum et al. does not teach that the gases transported in a return pipe to the torch are preheated. Thus, one skilled in the art, by reading Lynum et al., would not use a plasma torch to heat an oxidant gas feed stream, to preheat the combustion gases produced in a burner portion of the same, or to preheat the combustion gases produced in a burner portion of a different carbon black furnace. Instead, one skilled in the art, by reading Lynum et al. would conclude that a plasma torch is only used to decompose the feedstock instead of preheating the feedstock. Accordingly, one skilled in the art, by reading Rothbühr et al. in view of Lynum et al., would not select the elements from the two references for combination in a manner claimed by the applicants. The only way this rejection can be made is by the improper use of hindsight, by the improper use of an obvious to try standard, and/or by the manipulation of the references in a manner not taught or suggested by the references.

Accordingly, the rejection of Claim 4 under 35 U.S.C. §103(a) over Rothbühr et al. in view of Lynum et al. should be reversed.

Claim 5

Claim 5 on appeal requires that the oxidant gas feed stream is subjected to plasma heating prior to being fed to the burner portion. As pointed out above, Lynum et al. relates to passing a preheated feedstock of methane and/or natural gas through a plasma torch to cause a pyrolytic decomposition of the feedstock. Lynum et al. therefore fail to teach or suggest the recitations of Claim 5 on appeal.

Accordingly, the rejection of Claim 5 under 35 U.S.C. §103(a) over Rothbühr et al. in view of Lynum et al. should be reversed.

Claim 7

Claim 7 on appeal requires that the combustion gases produced in the burner portion by combustion of the heated, dewatered, off-gas with the oxidant gas feed stream are subjected to plasma heating prior to contacting hydrocarbon feedstock in the reactor portion of the carbon black furnace.

Again, Lynum et al. relates to passing a preheated feedstock of methane and/or natural gas through a plasma torch to cause a pyrolytic decomposition of the feedstock. Lynum et al. therefore fail to teach or suggest the recitations of Claim 7 on appeal.

Accordingly, the rejection of Claim 7 under 35 U.S.C. §103(a) over Rothbühr et al. in view of Lynum et al. should be reversed.

Conclusion

For the reasons set forth above, Appellants submit that the claims presently pending in the above-captioned application meet all of the requirements of patentability. It is therefore respectfully requested that the Honorable Board reverse the Examiner and remand this application for issue.

Respectfully submitted,

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(10) Claims Appendix

2. The furnace carbon black producing process in accordance with claim 15, wherein in steps (c) - (e), the heated, dewatered off-gas from step (b) is the only combustible gas supplied to the burner portion and wherein the combustible gas feed stream and oxidant gas feed stream are controlled to provide deep rich fuel conditions in steps (d) and (e).

3. The furnace carbon black producing process in accordance with claim 15, wherein the heated, dewatered off-gas is dewatered by means of pressure swing absorption.

4. The furnace carbon black producing process in accordance with claim 15, wherein the off-gas is subjected to plasma heating subsequent to removal of carbon black therefrom and prior to being fed to the burner portion.

5. The furnace carbon black producing process in accordance with claim 15, wherein the oxidant gas feed stream is subjected to plasma heating prior to being fed to the burner portion.

6. The furnace carbon black producing process of claim 15, wherein hydrocarbon feedstock is subjected to plasma heating prior to being fed to the carbon black furnace.

7. The furnace carbon black producing process of claim 15, wherein combustion gases produced in the burner portion by combustion of the heated, dewatered, off-gas with the oxidant gas feed stream are subjected to plasma heating prior to contacting hydrocarbon feedstock in the reactor portion of the carbon black furnace.

8. The furnace carbon black producing process of claim 15, wherein the oxidant gas feed stream to the burner portion comprises air plus oxygen enhancement, wherein the oxygen enhancement is produced by a pressure swing adsorption process.

15. A furnace carbon black producing process comprising the steps of:

(a) obtaining off-gas from a carbon black furnace,

(b) dewatering and heating the off-gas and substantially removing any existing carbon black therefrom to obtain dewatered and heated off-gas, and then

(c) feeding a combustion gas feed stream comprising the dewatered and heated off-gas and feeding an oxidant gas stream comprising an oxidant gas to a burner portion of the carbon black furnace, wherein the carbon black furnace comprises said burner portion wherein said combustion gas feed stream is combusted in the presence of said oxidant gas feed stream to produce hot combustion gases and a reactor portion wherein carbon black is produced by an interaction of the hot combustion gases with a hydrocarbon feedstock introduced to the reactor portion downstream of where said dewatered and heated off-gas is introduced in the carbon black furnace,

(d) controlling the combustion gas feed stream and oxidant gas feed stream so that the combusting of the combustion gas feed in the burner portion to produce hot combustion gases takes place in a fuel-rich condition so that the combustion gas feed stream does not completely combust in the burner portion of the carbon black furnace, and

(e) producing carbon black in the reactor portion of the carbon black furnace by interaction of the hot combustion gases with a hydrocarbon feedstock under said fuel rich conditions.

16. The process of claim 15, wherein steps (a) through (e) are repeated and wherein step (e)

of producing carbon black provides the off-gas for the succeeding step (a).

17. The process of claim 15, wherein in carrying out step (e), a hydrocarbon feedstock is supplied to the reactor portion by feeding the hydrocarbon feedstock to a passage between the burner portion and the reactor portion of the carbon black furnace.

18. A furnace carbon black producing process comprising the steps of:

(a) obtaining off-gas from a carbon black furnace,

(b) dewatering and heating the off-gas and substantially removing any existing carbon black therefrom to obtain dewatered and heated off-gas, and then

(c) feeding a combustion gas feed stream comprising the dewatered and heated off-gas and feeding an oxidant gas stream comprising an oxidant gas to a burner portion of a carbon black furnace, wherein the carbon black furnace to which the combustion gas feed stream and oxidant gas feed stream are fed is a different carbon black furnace from the carbon black furnace of step (a), wherein the carbon black furnace to which the combustion gas feed stream and oxidant gas feed stream are fed comprises said burner portion wherein a combustion gas feed stream is combusted in the presence of an oxidant gas feed stream to produce hot combustion gases and a reactor portion downstream of said burner portion wherein the hot combustion gases interact with a hydrocarbon feedstock to produce carbon black,

(d) controlling the combustion gas feed stream and oxidant gas feed stream so that combustion of the combustion gas feed in the burner portion to produce hot combustion gases takes place in a fuel-rich condition so that the combustion gas feed stream does not completely combust in the burner portion, and

(e) producing carbon black in the reactor portion of the carbon black furnace by interaction of the hot combustion gases with a hydrocarbon feedstock under said fuel rich

conditions.

(11) Evidence Appendix

None.

(12) Related Proceedings Appendix

None.